Spectrophotometric Determination of Microgram Amounts of Copper(II) with Succinimide in Presence of Aliphatic Amines

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Spektralphotometrische Bestimmung von Mikrogramm-Mengen Kupfer(II) mit Succinimid in Gegenwart von aliphatischen Aminen

Best. von Kupfer(II) mit Succinimid; Spektralphotometrie; neben aliphat. Aminen

Succinimide has been employed for the spectrophotometric determination of copper(II) in presence of aliphatic amines. The mixed ligand complexes of the type $[\text{Cu}(\text{succ.})_2(\text{A})_2]$ of ink blue colour are formed in the pH range from 4.0–10.5. The value of stability constant when A = iso-butyl amine is 7.5×10^5 and when A = iso-propyl amine is 8.2×10^5 . The complex of isobutyl amine was found to obey Lambert Beer's law, as determined from Ringbom plot, over the concentration range from 14–178 ppm and of isopropyl amine from 13–100 ppm for 1 cm cell at 590 nm. The mean sensitivities for these two complexes are $0.038 \mu\text{g}$ and $0.02 \mu\text{g}/\text{cm}^2/0.005$ absorbance unit. The blue colour formed when A = ammonia,

methyle amine or ethyle amine, is not sufficiently strong to be of much value in small amount analysis.

Three fold excess of succinimide and four fold excess of amine is required for complete colour development. The ink blue colour of the Cu(II) complexes remains stable for more than 24 h and remains so even on heating to 50°C , afterwards the colour is lightened.

No interference has been found in the presence of CH_3COO^- , NO_3^- , SCN^- , NO_2^- , F^- , Br^- , Cl^- , I^- , CO_3^{2-} , $\text{C}_2\text{O}_4^{2-}$, but the presence of SO_4^{2-} and PO_4^{3-} interferes seriously.

The interference due to the presence of Zn^{2+} , Cd^{2+} , Pb^{2+} , Ni^{2+} , Mn^{2+} , As^{3+} , Sb^{3+} , Fe^{3+} , Ge^{4+} , Se^{4+} , V^{4+} , Mo^{6+} was avoided by extraction of copper from 0.1–0.05 M hydrochloric acid solution with 10^{-2} to 10^{-4} M dithizone solution in carbon tetrachloride. The separation of copper from small amounts of Hg^{2+} was carried out by shaking the chloroform solution of the dithizonates of the two metals (20 ml) with 5 ml of 40% KBr solution and 50 ml of 0.25 M HCl. Copper remained in the chloroform layer and Hg went into the aqueous phase. The separation from Bi^{3+} was carried out by treating the aqueous solution of pH 3.0 with KI, then with CCl_4 solution of dithizone and then washing the CCl_4 extract with an iodide solution of pH 2.

The destruction of cupric dithizonate and excess of dithizone was carried out by evaporating the organic solvent and heating the residue two or three times with perchloric acid until an entirely colourless solution was obtained and then copper was estimated by this method, which gave very satisfactory results.

Silver was separated from copper by precipitation as chloride.

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